

What is claimed is:

1. A liquid processing apparatus comprising:

a liquid processing section for applying a
predetermined liquid processing to a substrate;

5 a carrier delivery section for delivering a carrier
having a plurality of substrates housed therein;

a carrier stock section capable of storing a
plurality of carriers;

10 a substrate transfer section for transferring the
substrate into said liquid processing section;

a carrier transfer device for transferring the
carrier within said carrier stock section;

15 a substrate inspecting device for inspecting the
number and/or the housed state of substrates within the
carrier; and

a carrier transfer device control section for
controlling said carrier transfer device such that the
carrier is stored in said carrier stock section in the
case where it is judged possible to apply a liquid
20 processing to the substrate on the basis of the result
of the inspection performed by said substrate inspecting
device.

25 2. The liquid processing apparatus according to
claim 1, wherein said carrier transfer device is also
capable of delivering the carrier into and out of said
carrier delivery section, said substrate inspecting
device inspects the substrate within the carrier

transferred into said carrier stock section, and said substrate transfer section transfers the substrate between said carrier stock section and said liquid processing section.

5 3. The liquid processing apparatus according to claim 1, wherein said substrate inspecting device is capable of inspecting the substrates within the carrier in the position where the substrates are delivered between said substrate transfer section and the carrier.

10 4. The liquid processing apparatus according to claim 1, wherein the carrier has a delivery port for delivering the substrates into and out of the carrier and a lid for opening/closing said delivery port, and said apparatus further comprises a lid opening/closing
15 mechanism for opening/closing said lid when the substrates within the carrier are inspected by said substrate inspecting device and/or the substrates are transferred between the carrier and said substrate transfer section.

20 5. The liquid processing apparatus according to claim 1, wherein said carrier transfer device is controlled by said carrier transfer device control section such that the carrier, for which it has been judged that the liquid processing of the substrates
25 within the carrier should be stopped, is returned back to said carrier delivery section.

6. The liquid processing apparatus according to

claim 1, wherein said carrier transfer device is controlled by said carrier transfer device control section such that, where another carrier, which is to be processed and forms a pair with the carrier for which it has been judged that the liquid processing of the substrates housed in the carrier should be stopped, is already stored in said carrier stock section, the another carrier is returned to said carrier delivery section.

7. The liquid processing apparatus according to claim 1, wherein the liquid processing of the substrate is started after the number of carriers stored in said carrier stock section has reached a predetermined number.

8. The liquid processing apparatus according to claim 1, wherein the substrates housed in at least two carriers are collectively subjected to a liquid processing.

9. The liquid processing apparatus according to claim 1, further comprising a parking area for temporally disposing a predetermined number of aligned substrates before the liquid processing in the vicinity of said liquid processing section.

10. The liquid processing apparatus according to claim 1, further comprising another substrate inspecting device for inspecting the number and/or arranged state of substrates after the liquid processing.

11. A liquid processing apparatus comprising:

a liquid processing section for applying a predetermined liquid processing to a substrate;

a carrier delivery section for delivering a carrier having a plurality of substrates housed therein

5 substantially horizontal a predetermined distance apart from each other;

a carrier stock section capable of storing a plurality of carriers;

10 a substrate transfer section for transferring the substrate into said liquid processing section;

a carrier transfer device for transferring the carrier within said carrier stock section;

15 a substrate inspecting device for inspecting the number and/or the housed state of substrates within the carrier; and

a carrier transfer device control section for controlling said carrier transfer device such that the carrier is stored in said carrier stock section in the case where it is judged possible to apply a liquid
20 processing to the substrate on the basis of the result of the inspection performed by said substrate inspecting device;

wherein said substrate transfer section includes:

25 a substrate delivery device for delivering substrates into and out of the carrier;

a substrate transfer device for delivering substrates into and out of said liquid processing

section; and

a substrate transplanting device for delivering the substrates in a substantially horizontal state into and out of said substrate delivery device and for delivering the substrates in substantially a vertical state into and out of said substrate transfer device.

12. The liquid processing apparatus according to claim 11, wherein said carrier transfer device is also capable of delivering the carrier into and out of said carrier delivery section, said substrate inspecting device inspects the substrate within the carrier transferred into said carrier stock section, said substrate transfer section transfers the substrate between said carrier stock section and said liquid processing section, and said substrate delivery device delivers the substrate into and out of the carrier within said carrier stock section.

13. The liquid processing apparatus according to claim 11, wherein said substrate transplanting device includes:

a posture changing mechanism for delivering the substrates in a substantially horizontal state into and out of said substrate delivery device and for changing the posture of the substrate between a substantially horizontal state and a substantially vertical state; and

a substrate vertical holding mechanism for delivering the substrates in a substantially vertical

state into and out of said posture changing mechanism and for delivering the substrates in a substantially vertical state into and out of said substrate transfer device.

5 14. The liquid processing apparatus according to claim 11, wherein said substrate inspecting device is capable of inspecting the substrates within the carrier at the position where the substrates are delivered between said substrate transfer section and the carrier.

10 15. The liquid processing apparatus according to claim 11, wherein the carrier has a delivery port for delivering the substrates into and out of the carrier and a lid for opening/closing said delivery port, and said apparatus further comprises a lid opening/closing
15 mechanism for opening/closing said lid when the substrates within the carrier are inspected by said substrate inspecting device and/or the substrates are transferred between the carrier and said substrate transfer section.

20 16. The liquid processing apparatus according to claim 11, wherein said carrier transfer device is controlled by said carrier transfer device control section such that the carrier, for which it has been judged that the liquid processing of the substrates
25 within the carrier should be stopped, is returned back to said carrier delivery section.

17. The liquid processing apparatus according to

claim 11, wherein said carrier transfer device is controlled by said carrier transfer device control section such that, where another carrier, which is to be processed and forms a pair with the carrier for which it has been judged that the liquid processing of the substrates housed in the carrier should be stopped, is already stored in said carrier stock section, the another carrier is returned to said carrier delivery section.

18. The liquid processing apparatus according to claim 11, wherein the liquid processing of the substrate is started after the number of carriers stored in said carrier stock section has reached a predetermined number.

19. The liquid processing apparatus according to claim 11, wherein the substrates housed in at least two carriers are collectively subjected to a liquid processing.

20. The liquid processing apparatus according to claim 11, further comprising a parking area for temporally disposing a predetermined number of aligned substrates before the liquid processing in the vicinity of said liquid processing section.

21. The liquid processing apparatus according to claim 11, further comprising another substrate inspecting device for inspecting the number and/or arranged state of substrates after the liquid processing.

22. A liquid processing apparatus comprising:

a liquid processing section for applying a predetermined liquid processing to a substrate;

a carrier delivery section for delivering a carrier having a plurality of substrates housed therein

5 substantially horizontal a predetermined distance apart from each other;

a carrier stock section capable of storing a plurality of carriers;

10 a substrate transfer section for transferring the substrate into said liquid processing section;

a carrier transfer device for transferring the carrier within said carrier stock section;

15 a substrate inspecting device for inspecting the number and/or the housed state of substrates within the carrier; and

a carrier transfer device control section for controlling said carrier transfer device such that the carrier is stored in said carrier stock section in the case where it is judged possible to apply a liquid
20 processing to the substrate on the basis of the result of the inspection performed by said substrate inspecting device;

wherein said substrate transfer section includes:

25 a substrate transfer device for delivering substrates into and out of said liquid processing section; and

a substrate delivery/posture changing device for

delivering the substrate into and out of the carrier and
for changing the posture of the held substrate between a
substantially horizontal state and a substantially
vertical state for delivery of the substrate into and
out of said substrate transfer device.

23. The liquid processing apparatus according to
claim 22, wherein said carrier transfer device is also
capable of delivering the carrier into and out of said
carrier delivery section, said substrate inspecting
device inspects the substrate within the carrier
transferred into said carrier stock section, said
substrate transfer section transfers the substrate
between said carrier stock section and said liquid
processing section, and said substrate delivery/posture
changing device delivers the substrate into and out of
the carrier within said carrier stock section.

24. The liquid processing apparatus according to
claim 22, wherein said substrate delivery/posture
changing device includes:

a plurality of support plates having projecting
portions abutting against the substrates formed in
predetermined positions on the front and back surfaces
and arranged substantially in parallel a predetermined
distance apart from each other;

a plate holding section for holding said plural
support plates;

a substrate holding pin fixed to substantially the

tip portion on the opposite side of said plate holding section in each of said plural support plates;

5 a substrate holding transfer guide movably arranged on the side of said plate holding section of said plural support plates;

a plate sliding mechanism joined to said plate holding section and collectively moving said plural support plates into and out of the carriers within said carrier stock section;

10 a swinging mechanism for collectively swinging said plural support plates by a predetermined angle; and

15 a lift mechanism for moving up and down said plate holding section by a predetermined distance in a direction perpendicular to the front and back surfaces of said support plate;

20 wherein the substrate is held between said substrate holding pin and said substrate holding transfer guide thereby to permit the substrate to be held on the side of any of the front and back surfaces of said support plate.

25 25. The liquid processing apparatus according to claim 22, wherein said substrate inspecting device is capable of inspecting the substrates within the carrier at the position where the substrates are delivered between said substrate transfer section and the carrier.

26. The liquid processing apparatus according to claim 22, wherein the carrier has a delivery port for

delivering the substrates into and out of the carrier
and a lid for opening/closing said delivery port, and
said apparatus further comprises a lid opening/closing
mechanism for opening/closing said lid when the
5 substrates within the carrier are inspected by said
substrate inspecting device and/or the substrates are
transferred between the carrier and said substrate
transfer section.

27. The liquid processing apparatus according to
10 claim 22, wherein said carrier transfer device is
controlled by said carrier transfer device control
section such that the carrier, for which it has been
judged that the liquid processing of the substrates
within the carrier should be stopped, is returned back
15 to said carrier delivery section.

28. The liquid processing apparatus according to
claim 22, wherein said carrier transfer device is
controlled by said carrier transfer device control
section such that, where another carrier, which is to be
20 processed and forms a pair with the carrier for which it
has been judged that the liquid processing of the
substrates housed in the carrier should be stopped, is
already stored in said carrier stock section, the
another carrier is returned to said carrier delivery
25 section.

29. The liquid processing apparatus according to
claim 22, wherein the liquid processing of the substrate

is started after the number of carriers stored in said carrier stock section has reached a predetermined number.

30. The liquid processing apparatus according to claim 22, wherein the substrates housed in at least two carriers are collectively subjected to a liquid processing.

31. The liquid processing apparatus according to claim 22, further comprising a parking area for temporally disposing a predetermined number of aligned substrates before the liquid processing in the vicinity of said liquid processing section.

32. The liquid processing apparatus according to claim 22, further comprising another substrate inspecting device for inspecting the number and/or arranged state of substrates after the liquid processing.

33. A liquid processing apparatus comprising:
a liquid processing section for applying a predetermined liquid processing to a substrate;
a carrier delivery section for delivering a carrier having a plurality of substrates housed therein;
a carrier stock section capable of storing a plurality of carriers;
a carrier transfer device for transferring the carrier within said carrier stock section;
a substrate inspecting device for inspecting the number and/or housed state of the substrates in the carrier;

a carrier retreat device for transferring the carrier between the inspecting position where the inspection is performed by said substrate inspection device and a predetermined retreat position;

5 a carrier transfer device control section for controlling said carrier transfer device such that the carrier is stored in said carrier stock section in the case where it is judged possible to apply a liquid processing to the substrate on the basis of the result
10 of the inspection performed by said substrate inspecting device; and

a substrate transfer section for transferring the substrate into said liquid processing section.

15 34. The liquid processing apparatus according to claim 33, wherein said carrier transfer device is also capable of delivering the carrier into and out of said carrier delivery section, said substrate inspecting device is capable of inspecting the substrate within the carrier transferred into said carrier stock section,
20 said substrate transfer section transfers the substrate between the carrier disposed on the inspecting position and said liquid processing section, and said substrate delivery device delivers the substrate into and out of the carrier within said carrier stock section.

25 35. The liquid processing apparatus according to claim 33, wherein said carrier transfer device is controlled by said carrier transfer device control

section such that, while the inspection by said
substrate inspecting device is being applied to a
carrier disposed on the inspecting position, said
carrier transfer device holds another carrier that is to
5 be inspected in the next step by said substrate
inspecting device and is put in a waiting position in
the vicinity of the inspecting position, and after the
inspection of the carrier in the inspecting position has
been finished and the inspected carrier is moved to the
10 retreat position by said carrier retreat device, the
carrier transfer device disposes the another carrier
held by said carrier transfer device on the inspecting
position, followed by receiving the carrier after the
inspection from said carrier retreat device and
15 subsequently storing the carrier in a predetermined
position.

36. The liquid processing apparatus according to
claim 33, wherein said carrier transfer device is
controlled by said carrier transfer device control
20 section such that the carrier, for which it has been
judged that the liquid processing of the substrates
within the carrier should be stopped, is returned back
to said carrier delivery section.

37. The liquid processing apparatus according to
25 claim 33, wherein said carrier transfer device is
controlled by said carrier transfer device control
section such that, where another carrier, which is to be

processed and forms a pair with the carrier for which it
has been judged that the liquid processing of the
substrates housed in the carrier should be stopped, is
already stored in said carrier stock section, the
5 another carrier is returned to said carrier delivery
section.

38. The liquid processing apparatus according to
claim 33, wherein the liquid processing of the substrate
is started after the number of carriers stored in said
10 carrier stock section has reached a predetermined number.

39. The liquid processing apparatus according to
claim 33, wherein the substrates housed in at least two
carriers are collectively subjected to a liquid
processing.

40. The liquid processing apparatus according to
15 claim 33, further comprising a parking area for
temporally disposing a predetermined number of aligned
substrates before the liquid processing in the vicinity
of said liquid processing section.

41. The liquid processing apparatus according to
20 claim 33, further comprising another substrate
inspecting device for inspecting the number and/or
arranged state of substrates after the liquid processing.

42. A liquid processing apparatus comprising:
25 a liquid processing section for applying a
predetermined liquid processing to a substrate;
a carrier delivery section for delivering a carrier

having a plurality of substrates housed therein
substantially horizontal a predetermined distance apart
from each other;

5 a carrier stock section capable of storing a
plurality of carriers;

a substrate transfer section for transferring the
substrate into said liquid processing section; and

a carrier transfer device for transferring the
carrier within said carrier stock section;

10 wherein said substrate transfer section includes:

a substrate transfer device for delivering the
substrate into and out of said liquid processing
section; and

15 a substrate delivery/posture changing device for
delivering the substrates into and out of the carrier
and for changing the posture of the held substrate
between a substantially horizontal state and a
substantially vertical state thereby transferring the
substrate into and out of said substrate transfer device.

20 43. The liquid processing apparatus according to
claim 42, wherein said carrier transfer device is also
capable of delivering the carrier into and out of said
carrier delivery section, said substrate transfer
section transfers the substrate between said carrier
25 stock section and said liquid processing section, and
said substrate delivery/posture changing device delivers
the substrate into and out of the carrier within said

carrier stock section.

44. The liquid processing apparatus according to claim 42, wherein said substrate delivery/posture changing device includes:

5 a plurality of support plates having projecting portions abutting against the substrates formed in predetermined positions on the front and back surfaces and arranged substantially in parallel a predetermined distance apart from each other;

10 a plate holding section for holding said plural support plates;

 a substrate holding pin fixed to substantially the tip portion in each of said plural support plates;

15 a substrate holding transfer guide movably arranged on the side of said plate holding section of said plural support plates;

 a plate sliding mechanism joined to said plate holding section and collectively moving said plural support plates into and out of the carriers within said carrier stock section;

 a swinging mechanism for collectively swinging said plural support plates by a predetermined angle; and

 a lift mechanism for moving up and down said plate holding section by a predetermined distance in a direction perpendicular to the front and back surfaces of said support plate;

 wherein the substrate is held between said

substrate holding pin and said substrate holding transfer guide thereby to permit the substrate to be held on the side of any of the front and back surfaces of said support plate.

5 45. A liquid processing method for applying a predetermined liquid processing to the substrates housed in a first carrier and a second carrier, comprising:

 a first step for inspecting the number and/or housed state of the substrates within the first carrier;

10 a second step for storing the first carrier within the carrier stock section in the case where it is judged by the inspection in said first step that it is possible to apply a liquid processing, and for stopping the liquid processing applied to the substrates stored in
15 the first and second carriers in the case where it is judged by the inspection in said first step that the liquid processing should be stopped;

 a third step for inspecting the number and/or housed state of the substrates within the second carrier
20 in the case where the first carrier is stored in the carrier stock section; and

 a fourth step for transferring the substrates within the second carrier to the liquid processing section in the case where it is judged by the inspection
25 in said third step that the liquid processing can be applied, followed by transferring the substrates within the first carrier into the liquid processing section, or,

where it is judged by the inspection in said third step that the liquid processing should be stopped, for stopping the liquid processing of the substrates within the second carrier.

5 46. The liquid processing method according to claim 45, wherein the arranged state of the substrates after the liquid processing is inspected.

47. A liquid processing method for applying a liquid processing to predetermined substrates,
10 comprising:

 a first step for inspecting the number and/or housed state of the substrates within a carrier;

 a second step for storing in a carrier stock section the carrier which has been judged to be capable
15 of the liquid processing in the inspection in said first step and stopping the liquid processing in respect of the carrier for which it has been judged in the inspection in said first step that the liquid processing should be stopped;

20 a third step for carrying out said first step and said second step for a predetermined number of carriers;

 a fourth step for transferring another carrier from the carrier stock section in the case where the another carrier, which is to be processed in a pair with the
25 carrier for which it has been judged in the inspection in said first step that the liquid processing should be stopped, is already stored in the carrier stock section;

and

a fifth step for starting the liquid processing that is applied to the substrates in the carrier after the number of carriers stored in the carrier stock section has reached the predetermined number.

48. The liquid processing method according to claim 47, wherein the substrates in at least two carriers are collectively subjected to a liquid processing in said fifth step.

49. The liquid processing method according to claim 47, wherein, while a liquid processing is being applied to a set of substrates in said fifth step, another set of substrates that are to be subjected to a liquid processing in the next stage are put in a waiting position in the vicinity of the process section in which the liquid processing is carried out.

50. The liquid processing method according to claim 47, wherein the arranged state of the substrates after the liquid processing is inspected.